Handout 1

Refinery and Crude Oil

Subchapter 10. Climate Change
Article 4. Regulations to Achieve Greenhouse Gas Emission Reductions

Subarticle 7. Low Carbon Fuel Standard

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§ 95481. Definitions and Acronyms. [from 95481, page 10]

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(41) "Low Complexity – Low Energy Use Refinery" means a refinery that meets both of the following criteria:

(A) A Modified Nelson Complexity Score equal to or less than 5 as calculated in section 95489(e)(1)(A).
(B) Total annual energy use equal to or less than 5 million MMBtu as calculated in section 95489(e)(1)(B).

(43) "Modified Nelson Complexity Score" means a Nelson Complexity Score that is calculated without including lube oil and asphalt capacity, as set forth in section 95489(e)(1)(A).

(48) "Nelson Complexity Score" means the commonly used industry measure of a refinery's ability to convert crude oils to finished fuels, taking into consideration the complexity of the technologies incorporated within the process and related capacities as compared to crude distillation.

(57) "Steam Quality" means the ratio of the mass of vapor to the total mass of a vapor-liquid mixture of water at its saturation temperature.

(63) "Transmix" means a mixture of refined products that forms when those products are transported in pipelines. This mixture is typically a combination of two of the following: gasoline, diesel, or jet fuel.

(b) *Acronyms.* For the purposes of sections 95480 through _____, the following acronyms apply.

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(26) "MMBtu" means million British Thermal Units.

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§ 95489. Provisions for Petroleum-Based Fuels. [from 95486(b) Table 8, page 67]

Table 8. Carbon Intensity Lookup Table for Crude Oil Production and Transport

Country of Origin	Crude Identifier	Carbon Intensity (gCO2e/MJ)
Baseline Crude Average*	California Average	12.81
	Kern Oil	TBD
	Paramount Petroleum Corporation	TBD
	San Joaquin Refining Company	TBD
Algeria	Saharan	10.75
Angola	Cabinda	9.16
	Dalia	8.74
	Gimboa	8.82
	Girassol	9.50
	Greater Plutonio	8.89
	Hungo	8.23
	Kissanje	8.78
	Mondo	8.95
	Nemba	9.27
	Pazflor	8.06
Argentina	Canadon Seco	8.20
	Escalante	8.22
	Hydra	7.19
	Medanito	9.10
Australia	Enfield	4.06
	Pyrenees	4.99
	Stybarrow	5.24
	Van Gogh	5.14
	Vincent	4.02
Azerbaijan	Azeri	7.37
Brazil	Albacora Leste	5.54
	Bijupira-Salema	7.24
	Frade	5.07
	Jubarte	7.29
	Lula	9.07
	Marlim	6.72
	Marlim Sul	7.70
	Ostra	5.46
	Polvo	5.33
	Roncador	6.61
	Roncador Heavy	6.09

	Sapinhoa	7.66
Cameroon	Lokele	21.18
Canada	Access Western Blend	16.31
	Albian Heavy Synthetic	20.04
	Albian Muskeg River Heavy	20.04
	Borealis	18.85
	Bow River	8.17
	Cardium	7.38
	Cold Lake	18.69
	Federated	7.38
	Fosterton	8.17
	Halkirk	7.38
	Koch Alberta	7.38
	Light Sweet	7.38
	Lloydminster	8.17
	Mixed Sweet	7.38
	Peace River Heavy	21.10
	Peace River Sour	7.38
	Pembina	7.38
	Shell Synthetic (all grades)	21.39
	Suncor Synthetic (all grades)	23.78
	Surmont	18.19
	Syncrude Synthetic (all grades)	21.39
	Wabasca	5.70
Chad	Doba	7.02
Colombia	Cano Limon	8.55
	Castilla	8.72
	Cusiana	9.77
	Magdalena	21.37
	Rubiales	8.33
	South Blend	8.36
	Vasconia	8.46
Congo	Azurite	10.63
	Djeno	10.99
Ecuador	Napo	8.49
	Oriente	9.81
Equatorial Guinea	Ceiba	9.99
	Zafiro	20.62
Iraq	Basra Light	12.21
Kuwait	Kuwait	9.44
Libya	Amna	13.08
Malaysia	Tapis	10.09
Mauritania	Chinguetti	8.40
Mexico	Isthmus	9.29
	Isthmus Topped	12.29

	Maya	6.90
Neutral Zone	Eocene	6.43
	Khafji	8.17
	Ratawi	8.35
Nigeria	Agbami	18.40
	Amenam	17.08
	Antan	32.54
	Bonga	5.53
	Bonny	14.72
	Brass	81.68
	EA	5.33
	Erha	9.62
	Escravos	19.64
	Forcados	21.60
	Okono	26.69
	OKWB	33.90
	Pennington	20.80
	Qua Iboe	14.37
	Yoho	14.37
Oman	Oman	11.77
Peru	Loreto	7.17
	Mayna	8.77
Russia	ESPO	12.80
	M100	18.30
	Sokol	9.60
	Vityaz	10.91
Saudi Arabia	Arab Extra Light	8.43
	Arab Light	8.28
	Arab Medium	7.78
	Arab Heavy	7.91
Thailand	Bualuang	4.23
Trinidad	Calypso	6.51
	Galeota	10.11
UAE	Murban	9.00
	Upper Zakum	8.09
Venezuela	Bachaquero	25.81
	Boscan	9.49
	Hamaca	22.28
	Hamaca DCO	6.58
	Laguna	25.81
	Mesa 30	10.56
	Petrozuata (all synthetic grades)	22.30
	Zuata (all synthetic grades)	22.28
US Alaska	Alaska North Slope	16.29
US Colorado	Niobrara	7.11

US New Mexico	Four Corners	7.93
US North Dakota	Bakken	9.24
	North Dakota Sweet	9.24
US Oklahoma	Oklahoma Sweet	9.82
US Texas	Eagle Ford Shale	9.82
	West Texas Intermediate	9.82
US Utah	Covenant	2.81
	Utah Sweet	5.22
US Wyoming	Wyoming Sweet	23.20
US California Fields	Aliso Canyon	4.64
	Ant Hill	21.99
	Antelope Hills	6.74
	Antelope Hills, North	21.08
	Arroyo Grande	32.71
	Asphalto	9.63
	Bandini	7.23
	Bardsdale	4.19
	Barham Ranch	3.22
	Beer Nose	3.02
	Belgian Anticline	4.21
	Bellevue	7.97
	Bellevue, West	4.99
	Belmont, Offshore	4.57
	Belridge, North	5.37
	Belridge, South	16.83
	Beverly Hills	5.00
	Big Mountain	3.01
	Blackwells Corner	4.95
	Brea-Olinda	3.37
	Buena Vista	8.05
	Burrel	25.60
	Cabrillo	3.18
	Canal	4.60
	Canfield Ranch	4.48
	Carneros Creek	3.89
	Cascade	2.40
	Casmalia	9.56
	Castaic Hills	2.92
	Cat Canyon	4.08
	Cheviot Hills	3.82
	Chico-Martinez	17.41
	Cienaga Canyon	4.59
	Coalinga	32.97
	Coles Levee, N	5.02
	Coles Levee, S	4.14

	Comanche Point	8.24
	Coyote, East	6.33
	Cuyama, South	14.93
	Cymric	21.64
	Deer Creek	9.89
	Del Valle	5.25
	Devils Den	6.27
	Edison	16.81
	El Segundo	3.93
	Elk Hills	7.35
	Elwood, S., Offshore	4.03
	Fruitvale	4.07
	Greeley	10.09
	Hasley Canyon	2.34
	Helm	4.51
	Holser	3.52
	Honor Rancho	4.51
	Huntington Beach	5.31
	Hyperion	2.22
	Inglewood	9.70
	Jacalitos	2.81
	Jasmin	13.90
	Kern Front	29.57
	Kern River	12.92
	Kettleman Middle Dome	4.27
	Kettleman North Dome	5.79
	Landslide	12.64
	Las Cienegas	5.11
	Livermore	2.93
	Lompoc	19.86
	Long Beach	7.00
	Long Beach Airport	4.43
	Los Angeles Downtown	6.16
	Los Angeles, East	10.49
	Lost Hills	11.39
	Lost Hills, Northwest	4.32
	Lynch Canyon	12.89
	Mahala	2.85
	McCool Ranch	3.24
	McDonald Anticline	4.54
	McKittrick	28.96
	Midway-Sunset	29.46
	Montalvo, West	2.47
	Montebello	15.44
	Monument Junction	4.21

	Mount Poso	11.88
	Mountain View	4.13
	Newhall-Potrero	3.38
	Newport, West	4.59
	Oak Canyon	4.00
	Oak Park	2.65
	Oakridge	2.57
	Oat Mountain	2.84
	Ojai	3.26
	Olive	1.92
	Orcutt	13.79
	Oxnard	9.82
	Paloma	4.11
	Placerita	41.86
	Playa Del Rey	4.77
	Pleito	2.79
	Poso Creek	32.01
	Pyramid Hills	3.52
	Railroad Gap	6.51
	Raisin City	9.22
	Ramona	3.74
	Richfield	4.59
	Rincon	4.38
	Rio Bravo	6.26
	Rio Viejo	3.26
	Riverdale	4.23
	Rose	3.13
	Rosecrans	5.96
	Rosecrans, South	3.56
	Rosedale	6.88
	Rosedale Ranch	8.23
	Round Mountain	27.91
	Russell Ranch	8.08
	Salt Lake	2.93
	Salt Lake, South	4.18
	San Ardo	31.41
	San Miguelito	6.10
	San Vicente	2.70
	Sansinena	2.76
	Santa Clara Avenue	3.73
	Santa Fe Springs	10.91
	Santa Maria Valley	5.12
	Santa Susana	3.73
	Sargent	4.44
	Saticoy	3.82

	Sawtelle	3.37
	Seal Beach	5.28
	Semitropic	3.90
	Sespe	3.33
	Shafter, North	3.45
	Shiells Canyon	4.08
	South Mountain	3.80
	Stockdale	2.54
	Tapia	8.13
	Tapo Canyon, South	3.09
	Tejon	6.65
	Tejon Hills	6.85
	Tejon, North	4.27
	Temescal	2.99
	Ten Section	7.04
	Timber Canyon	3.66
	Torrance	4.65
	Torrey Canyon	3.20
	Union Avenue	4.04
	Ventura	5.04
	Wayside Canyon	1.85
	West Mountain	3.10
	Wheeler Ridge	4.74
	White Wolf	1.80
	Whittier	2.66
	Wilmington	7.22
	Yowlumne	11.07
	Zaca	8.10
US Federal OCS	Beta	1.91
	Carpinteria	3.31
	Dos Cuadras	4.50
	Hondo	6.18
	Hueneme	3.01
	Pescado	6.61
	Point Arguello	15.68
	Point Pedernales	9.86
	Sacate	4.30
	Santa Clara	2.68
	Sockey	9.14
US California Other	Kern Topped	TBD
Default		12.81

* Based on production and transport of the crude oil supplied to the indicated California refinery(ies) during the baseline calendar year, 2010

(a) *General.*

Deficit calculations to be used for a regulated party's CARBOB or diesel fuel are specified in subdivision (b). Requirements for adding incremental emission increases associated with an increase in the carbon intensity of crude oil to a regulated party's compliance obligation are specified in subdivision (c). The credit calculation for crude oil that is produced using innovative methods such as carbon capture and sequestration (CCS) is specified in subdivision (d). Special requirements for low complexity-low energy use refineries are specified in subdivision (e). The credit calculation for investments that reduce greenhouse gas emissions at refineries is specified in subdivision (f).

(b) *Deficit Calculation for CARBOB or Diesel Fuel*

A regulated party for CARBOB or diesel fuel must calculate separately the base deficit and incremental deficit for each fuel or blendstock derived from petroleum feedstock as specified in this provision.

Base Deficit Calculation

$$Deficits_{Base}^{XD}(MT) = (CI_{Standard}^{XD} - CI_{BaselineAve}^{XD}) \times E^{XD} \times C$$

Incremental Deficit Calculation to Mitigate Increases in the Carbon-Intensity of Crude Oil

If $CI_{20XXCrudeAve} > CI_{BaselineCrudeAve}$ *then:*

$$Deficits_{Incremental20XX}^{XD} = (CI_{BaselineCrudeAve} - CI_{20XXCrudeAve}) \times E^{XD} \times C$$

If $CI_{20XXCrudeAve} \leq CI_{BaselineCrudeAve}$ *then:*

$$Deficits_{Incremental20XX}^{XD} = 0$$

where,

$Deficits_{Base}^{XD}(MT)$ and $Deficits_{Incremental20XX}^{XD}$ mean the amount of LCFS deficits incurred (a negative value), in metric tons, by the volume of CARBOB (XD = "CARBOB") and diesel (XD = "diesel") that is derived from petroleum feedstock and is either produced in or imported into California during a specific calendar year;

$CI_{Standard}^{XD}$ has the same meaning as specified in section 95486(b)(3)(A);

$CI_{BaselineAve}^{XD}$ is the average carbon-intensity value of CARBOB or diesel, in gCO_2e/MJ, that is derived from petroleum feedstock and is either produced in or imported into California during the baseline calendar year, 2010. For purposes of this provision, $CI_{BaselineAve}^{XD}$ for CARBOB (XD = "CARBOB") and diesel fuel (XD =

"diesel") are the Baseline Average carbon intensity values for CARBOB and diesel (ULSD) set forth in the Carbon Intensity Lookup Table. The Baseline Average carbon intensity values for CARBOB and diesel (ULSD) are calculated using data for crude oil supplied to California refineries during the baseline calendar year, 2010.

$CI_{BaselineCrudeAve}$ is the California average crude oil carbon-intensity value, in gCO_2e/MJ, attributed to the production and transport of the crude oil supplied as petroleum feedstock to California refineries during the baseline calendar year, 2010. For purposes of this provision, $CI_{BaselineCrudeAve}$ is the Baseline Crude Average carbon intensity value set forth in the Lookup Table. The Baseline Crude Average carbon intensity value is calculated using data for crude oil supplied to California refineries during the baseline calendar year, 2010.

$CI_{20XXCrudeAve}$ is the California average crude oil carbon-intensity value, in gCO_2e/MJ, attributed to the production and transport of the crude oil supplied as petroleum feedstock to California refineries during specified calendar years. $CI_{20XXCrudeAve}$ will be calculated annually as described in subdivision (c). $CI_{2012CrudeAve}$ will be calculated using data for crude oil supplied to California refineries during the calendar year 2012. $CI_{2013CrudeAve}$ will be calculated using data for crude oil supplied to California refineries during the calendar years 2012 and 2013. $CI_{2014CrudeAve}$ will be calculated using data for crude oil supplied to California refineries during the calendar years 2012, 2013, and 2014. All subsequent updates to $CI_{20XXCrudeAve}$ will be calculated using data for crude oil supplied to California refineries during the most recent three calendar years.

E^{XD} is the amount of fuel energy, in MJ, from CARBOB (XD = "CARBOB") or diesel (XD = "diesel"), determined from the energy density conversion factors in Table 4, either produced in California or imported into California during a specific calendar year.

$$C = 1.0 \times 10^{-6} \frac{MT}{gCO_2e}$$

(c) *Addition of Incremental Deficits that Result from Increases in the Carbon-Intensity of Crude Oil to a Regulated Party's Compliance Obligation.*

(1) Incremental deficits for CARBOB or diesel fuel that result from increases in the carbon-intensity of crude oil will be calculated and added to each affected regulated party's compliance obligation for the compliance period in which the $Deficits^{XD}_{Incremental20XX}$ become effective, which will be the year following the year in which the $CI_{20XXCrudeAve}$ was established.

(2) Incremental deficits for CARBOB or diesel fuel for each regulated party will be based upon the amount of CARBOB and Diesel fuel supplied by

the regulated party in each compliance period for which the $Deficits^{XD}_{Incremental20XX}$ are effective.

(3) Process for Calculating the Annual Crude Average Carbon Intensity Value.

(A) The Annual Crude Average carbon intensity value will be calculated using a volume-weighted average of individual crude carbon intensity values. Volumes for individual crudes will be the total volumes reported by all regulated parties in the Annual Compliance Reports for the calendar year. Individual crude carbon intensity values are those listed in Table 8. For crude names not listed, the default carbon intensity value from Table 8 will be used until January 1 of the year that the crude name and carbon intensity value is certified by the Executive Officer as described in subsection (C) below.

(B) Within 15 days of receiving the Annual Compliance reports, the Executive Officer shall post the Annual Crude Average carbon intensity calculation at the ARB-LCFS website (http://www.arb.ca.gov/fuels/lcfs/lcfs.htm) for public comment. Written comments shall be accepted for 15 days following the date on which the analysis was posted. Only comments related to potential factual or methodological errors in the posted Annual Crude Average carbon intensity value may be considered. The Executive Officer shall evaluate the comments received and, if the Executive Officer deems it necessary, may request in writing additional information or clarification from the commenters. Commenters shall be provided 10 days to respond to these requests. The Executive Officer shall post the final Annual Crude Average carbon intensity value at the ARB-LCFS website within 15 days of completion of the comment period, if no comments are received. If comments are received, the Executive Officer shall post the final Annual Crude Average carbon intensity value within 30 days of completion of the comment period or within 25 days of the latest request by the Executive Officer for additional information or clarification from a commenter, whichever is later.

(C) Within 30 days of receiving fourth quarter compliance reports, the Executive Officer will propose carbon intensity values for all crude names not listed in Table 8 that were supplied to California refineries during the previous calendar year. The proposed carbon intensity values and supporting documentation will be posted at the ARB-LCFS website (http://www.arb.ca.gov/fuels/lcfs/lcfs.htm) for public comment. Written comments shall be accepted for 15 days following the date on which the analysis was posted. Only

comments related to potential factual or methodological errors in the posted carbon intensity values may be considered. The Executive Officer shall evaluate the comments received and, if the Executive Officer deems it necessary, may request in writing additional information or clarification from the commenters. Commenters shall be provided 10 days to respond to these requests. The Executive Officer shall post the certified carbon intensity values at the ARB-LCFS website within 15 days of completion of the comment period, if no comments are received. If comments are received, the Executive Officer shall post the certified carbon intensity values within 30 days of completion of the comment period or within 25 days of the latest request by the Executive Officer for additional information or clarification from a commenter, whichever is later. The crude carbon intensity values will apply retroactively to crude volumes supplied to California refineries from January 1 of year the carbon intensity values are certified. These crudes will subsequently be added to Table 8 as discussed in subsection (D) below.

(D) Revisions to the OPGEE model, addition of crudes to Table 8, and updates to all carbon intensity values listed in Table 8 will occur on a three year cycle and be considered through an Executive Officer hearing process.

(d) *Credit for Producing Crudes using Innovative Methods*.

A crude oil producer or refinery receiving the crude may generate credit for crude oil that has been produced using innovative methods and delivered to California refineries for processing.

(1) General Requirements.

(A) For the purpose of this section, an innovative method means crude production using one or more of the following technologies:

1. Solar- or waste biomass-based steam generation (generated steam of 75 percent quality or greater). Steam must be used onsite at the crude oil production facilities.

2. Carbon capture and storage (CCS). Carbon capture must take place onsite at the crude oil production facilities.

3. Solar-, wind-, or waste biomass-based electricity generation. Electricity must be consumed onsite at the crude oil production facilities.

4. Solar- or waste biomass-based heat generation. Heat must be used onsite at the crude oil production facilities.

(B) The innovative crude oil production method must be implemented during or after the year 2015 and must be approved for use pursuant to this section before the crude oil producer or purchasing refinery can receive credit under the LCFS regulation. Credit generation for CCS projects will only be allowed through the use of a Board-approved quantification methodology including monitoring, reporting, verification, and permanence requirements associated with the carbon storage method being proposed for the innovative crude production method.

(C) Applicant: The regulatory approval of the innovative method must be initiated by the crude oil producer (applicant) through a written application to the Executive Officer. If the innovative method involves steam, heat, or electricity produced by a third party and delivered to the crude oil producer, both the crude producer and the third party must apply and will be considered joint applicants for approval of the innovative method. If the innovative method involves delivery of carbon captured by the crude oil producer to a third party that subsequently stores the carbon, both the crude producer and the third party must apply and will be considered joint applicants for approval of the innovative method.

(D) The innovative crude oil production method must satisfy one of the following threshold criteria:

1. A carbon intensity reduction from the comparison baseline of at least 0.10 gCO_2e/MJ, or
2. An emissions reduction of at least 5,000 metric tons CO_2e per year

(E) Credits for producing crude oil with innovative methods must be calculated as specified below:

For crude oil produced using solar steam generation (generated steam of 75 percent quality or greater):

$$Credits_{Innov}(MT) = 29360 \times \frac{V_{steam} \times f_{solar}}{V_{crudeproduced}} \times V_{Innov} \times C$$

For crude oil produced using solar or wind based electricity:

$$Credits_{Innov}(MT) = 511 \times \frac{E_{electricity} \times f_{renew}}{V_{crudeproduced}} \times V_{Innov} \times C$$

For crude oil produced using all other innovative methods:

$$Credits_{Innov}(MT) = \Delta CI_{Innov} \times E_{Innov} \times V_{Innov} \times C$$

where,

$Credits_{Innov}(MT)$ means the amount of LCFS credits generated (a positive value), in metric tons, by the volume of a crude oil produced using the innovative production method and delivered to California refineries for processing;

V_{steam} means the overall volume, in barrels cold water equivalent, of steam injected;

f_{solar} means the fraction of injected steam that is produced using solar;

$V_{crudeproduced}$ means the volume, in barrels, of crude oil produced using the innovative method;

V_{Innov} means the volume, in barrels, of crude oil produced using the innovative method and delivered to California refineries for processing. If the innovative crude is delivered to California refineries as part of a blend, then V_{Innov} is the volume of blend delivered to California refineries multiplied times the volume fraction of innovative crude within the blend.

$$C = 1.0 \times 10^{-6} \frac{MT}{gCO_2e}$$

$E_{electricity}$ means the overall electricity consumption to produce the crude, in kW-hr;

f_{renew} means the fraction of consumed electricity that is produced using solar or wind power;

ΔCI_{Innov} means the reduction in carbon intensity (a positive value), in gCO_2e/MJ_{crude}, associated with crude oil production with the innovative method as compared to crude oil production by a baseline process without the method (hereafter referred to as the comparison baseline method); and

E_{Innov} means the energy density (lower heating value), in MJ/barrel, for the crude oil produced with the innovative method.

(2) Application and Data Submittal. Unless otherwise noted, all applications for an innovative crude oil production method shall comply with the requirements below:

(A) An applicant that submits any information or documentation in support of a proposed innovative crude oil production method must include a written statement clearly showing that the applicant understands and agrees to the following:

1. The applicant must specifically identify all information submitted pursuant to this provision that is a trade secret; "trade secret" has the same meaning as defined in Government Code section 6254.7;

2. All information in the application not identified as trade secrets is subject to public disclosure pursuant to title 17, CCR, sections 91000-91022 and the California Public Records Act (Government Code sec. 6250 et seq.); and

3. If the application is approved, the crude oil producer must register under section 95483.1 as an opt-in regulated party to receive LCFS credit for an innovative crude oil production method. If the crude oil producer does not intend to register as an opt-in regulated party, the producer must state so in writing, in which case the California refinery(ies) that purchase the innovative crude may then claim the credit.

(B) All applications must contain the following summary material:

1. A complete description of the innovative method and how emissions are reduced;

2. An engineering drawing(s) or process flow diagram(s) that illustrates the innovative method and clearly identifies the system boundaries, relevant process equipment, mass flows, and energy flows necessary to calculate the innovative production method credits;

3. A map including global positioning system coordinates for the facilities described in subsection 2, above; and

4. A preliminary estimate of the potential innovative production method credit, including descriptions and copies of production and operational data or other technical documentation utilized in support of the calculation.

(C) All applications except for solar-generated steam (75 percent steam quality or greater), wind-based electricity, or solar-based electricity shall include a detailed description of the innovative method and its comparison baseline method. The description of innovative and comparison baseline methods can be limited to those portions of the crude production process affected by the innovative method. The description of the innovative method and its comparison baseline method must include each of the following, to the extent each is applicable to the innovative method:

1. Schematic flow charts that identify the system boundaries used for the purposes of performing the life cycle analyses on the proposed innovative crude oil production method and the comparison baseline method. Each piece of equipment or stream appearing on the process flow diagrams shall be clearly identified and shall include data on its energy and materials balance. The system boundary shall be clearly shown in the schematic.

2. A description of all material and energy inputs entering the system boundaries, including their points of origination, modes of transportation, transportation distances, means of storage, and all processing to which material inputs are subject.

3. A description of all material and energy products, co-products, byproducts, and waste products leaving the system boundaries, including their respective destinations, transportation modes, and transportation distances.

4. A description of all facilities within the system boundaries involved in the production of the crude oil and other byproducts, co-products, and waste products.

5. A description of all combustion and electricity-powered equipment within the system boundaries, including their respective capacities, sizes, or rated power, fuel utilization type, fuel shares, energy efficiency (LHV basis), and proposed use.

6. A description of all thermal and electrical energy production that occurs within the system boundaries, including the respective capacities, sizes, or rated power, fuel utilization type, fuel shares, energy efficiency (LHV basis), and proposed use.

7. A description of all sources of flared, vented, and fugitive emissions within the system boundaries, including the compositions of the flared, vented, and fugitive emission streams leaving the system boundaries.

(D) All applications except for solar-generated steam (75 percent steam quality or greater), wind-based electricity, or solar-based electricity shall include life cycle assessments (LCAs) performed on the proposed innovative crude oil production method and its comparison baseline method using the ARB OPGEE model or an alternative model or LCA methodology approved by the Executive Officer. Electronic copies of the models and calculations shall be provided with the application. For biomass-based steam generation, the comparison baseline method shall include steam generation in a natural gas fired generator with an efficiency of 88 percent on a lower heating value basis. For biomass-based electricity, the comparison baseline method shall include electricity generation with a carbon intensity of 511 gCO_2e/kW-hr. The descriptions of the life cycle assessment results must provide:

1. Detailed information on the energy consumed and greenhouse gas emissions generated for the innovative method and the comparison baseline method;

2. Documentation of all non-default model input values used in the emissions calculation process. If values for any significant production parameters are unknown, the application shall so state and model default values shall be used for these parameters in the analysis;

3. Detailed description of all supporting calculations that were performed outside of the model; and

4. Documentation of all modifications other than those covered by item 2. above, made to the model. This discussion shall include sufficient specific detail to enable the Executive Officer to replicate all such modifications and, in combination with the inputs and supporting calculations identified in items 2. and 3. above, replicate the carbon intensity results reported in the application.

(E) All applications shall include a list of references covering all information sources used in the preparation of the life cycle analysis and/or calculation of innovative production method credit. All reference citations in the application shall include in-text

parentheticals stating the author's last name and date of publication. All in-text parenthetical citations shall correspond to complete publication information provided in the list of references, and complete publication information shall at a minimum, identify the author(s), author's affiliation, title of the referenced document, publisher, publication date, and pages cited. For internet citations, the reference shall include the universal resource locator (URL) address of the citation, as well as the date the website was last visited.

(F) All applications shall include a signed transmittal letter from the applicant attesting to the veracity of the information in the application packet and declaring that the information submitted accurately represents the actual and/or intended long-term, steady-state operation of the innovative crude oil production method described in the application packet. The transmittal letter shall be the original copy, be on company letterhead, be signed by an officer of the applicant with authority to attest to the veracity of the information in the application and to sign on behalf of the applicant, and be from the applicant and not from an entity representing the applicant (such as a consultant or legal counsel).

(G) All documents (including spreadsheets and other items not in a standard document format) that contain confidential business information (CBI) must prominently display the phrase "Contains Confidential Business Information" above the main document title and in a running header. Additionally, a separate, redacted version of such documents must also be submitted. The redacted versions must be approved by the applicant for posting to a public LCFS web site. Within redacted documents, specific redactions must be replaced with the phrase "Confidential business information has been deleted." This phrase must be displayed clearly and prominently wherever CBI has been redacted.

(H) All applications, supporting documents, and all other relevant data or calculation or other documentation, except for the transmittal letter described in paragraph (F) above, shall be submitted electronically such as via e-mail or an online-based interface unless the Executive Officer has approved or requested in writing another submission format.

(3) Application Approval Process. The application must be approved pursuant to this section before the crude oil producer or purchasing refinery may obtain credit under the LCFS regulation for the innovative crude.

(A) Within 30 calendar days of receipt of an application designated by the applicant as ready for formal evaluation, the Executive Officer shall advise the applicant in writing either that:

1. The application is complete, or

2. The application is incomplete and the Executive Officer will identify which requirements of subsections 95489(d)(1) and (2) above have not been met.

   a. The applicant will be permitted to submit additional information to meet the requirements to subsections 95489(d)(1) and (2).

   b. If the applicant is unable to achieve a complete application within 180 days of the Executive Officer's receipt of the application, the application will be denied on that basis, and the applicant will be informed in writing.

(B) Once the Executive Officer has deemed an application to be complete, it will be posted for public comment at http://www.arb.ca.gov/fuels/lcfs/lcfs.htm. Comments will be accepted for 10 days following the date on which the application was posted. Only comments related to potential factual or methodological errors may be considered. The Executive Officer will forward to the applicant all comments identifying potential factual or methodological errors. Within 30 days, the applicant shall either make revisions to its application and submit those revisions to the Executive Officer, or submit a detailed written response to the Executive Officer explaining why no revisions are necessary.

(C) An application submitted pursuant to this section shall not be approved if the Executive Officer determines:

1. Based upon the application information submitted pursuant to this section, the proposed crude production method is not innovative, as that term is defined in this section.

2. Based upon the application information submitted pursuant to this section, the LCA methodology and/or proposed comparison baseline is not appropriate.

3. Based upon the application information submitted pursuant to this section, the applicant's greenhouse gas emissions calculations cannot be replicated using the ARB OPGEE

model or alternative model or LCA methodology approved by the Executive Officer.

(D) As part of any final action approving an application, the Executive Officer may prescribe to the applicant any special limitations, recordkeeping requirements, and operational conditions that the Executive Officer determines should apply to the innovative crude oil production method. If the Executive Officer determines the application will not be approved, and the applicant will be notified in writing and the basis for the disapproval shall be identified.

(4) Recordkeeping. Each applicant that has crude approved as innovative must maintain records identifying each facility at which it produces crude oil for sale in California under the approved innovative crude oil production method. For each such facility, the applicant must compile records for at least three years showing:

A. The quarterly volume of crude oil produced using the approved innovative crude oil production method and the crude name(s) under which it is marketed. If the crude oil approved as innovative is marketed as part of a crude blend, the crude oil producer must also maintain for at least three years quarterly records identifying the name of the blend and the volume fraction that the innovative crude contributes to the blend.

B. Compliance with all limitations, recordkeeping requirements and operational conditions identified by the Executive Officer in subsection 95489(d)(3)(D), above.

These records shall be submitted to the Executive Officer within 20 days of a written request received from the Executive Officer or his/her designee, provided the request is made before the expiration of the period during which the records are required to be retained.

(5) Credits for producing crude oil using innovative methods. Within 30 days of receiving quarterly reports from California refineries detailing crude names and volumes supplied to the refineries during the previous calendar quarter and any records requested of the applicant under subsection 95489(d)(4) above, the Executive Officer will determine the amount of credits to be issued to the crude oil producer or purchasing refinery.

(e) *Low Complexity- Low Energy Use Refinery.*

(1) A Low Complexity – Low Energy Use Refinery must meet the criteria in section 95481(a)(41) using the following equations:

(A) Modified Nelson Complexity Score

$$Modified\ Nelson\ Complexity\ Score = \sum_{i}^{n} (index_i)\left(\frac{Capacity_i}{Capacity_{dist}}\right)$$

where:

$index_i$ is the 2012 Nelson Complexity Index listed in Table 3;
$Capacity_i$ is the capacity of each unit listed in Table 3;
$Capacity_{dist}$ is the capacity of distillation unit;
i is the process unit; and
n is the total number of process units.

Table 3. Nelson Complexity Indices.

Process Unit	***Index Value***
Vacuum Distillation	1.30
Thermal Processes	2.75
Delayed and Fluid Coking	7.50
Catalytic Cracking	6.00
Catalytic Reforming	5.00
Catalytic Hydrocracking	8.00
Catalytic Hydrorefining/Hydrotreating	2.50
Alkylation	10.00
Polymerization	10.00
Aromatics	20.00
Isomerization	3.00
Oxygenates	10.00
Hydrogen	1.00
Sulfur Extraction	240.00

(B) Annual Energy Use

$$Annual\ Energy\ Use\ (in\ MMBtu) = fuel\ use + electricity + thermal$$

where:

$fuel\ use$ is the MMBtu of all fuel combusted during compliance period;
$electricity$ is the imported electricity minus exported electricity per year converted to MMBtu by using 3.142 MMBtu/MWh; and
$thermal$ is the imported thermal energy minus exported thermal energy per year in MMBtu.

(2) In addition to other reporting requirements, a regulated party who is including adjustments or credits for a Low Complexity – Low Energy Use Refinery must also report the following information for that refinery:

(A) The volume of CARBOB and diesel produced from crude oil;
(B) The volume of CARBOB and diesel produced from transmix;
(C) The volume of CARBOB and diesel produced from intermediate feedstocks; and
(D) The volume of CARBOB and diesel purchased for blending.

(3) Credits and deficits for a low complexity – low energy use refinery must be calculated in the LCFS Reporting Tool using the following equations:

(A) *Carbon Intensity Adjustment.* For volumes reported in section 95489(e)(2):

$$CI^{XD}_{LC-LE} = CI^{XD}_{reported} - Adjustment$$

where:

$CI^{XD}_{Reported}$ is the carbon intensity pursuant to section 95486(b)(3);
Adjustment is the value listed in Table 5.

Table 5: Adjustment for CARBOB and diesel

Volume Reported	Adjustment (gCO_2e/MJ)
Section 95489(e)(2)(A)	5
Section 95489(e)(2)(B),(C), and (D)	0

(B) For CARBOB and diesel volumes reported in 95489(e)(2)

$$Credits^{XD}_{LC-LE} | Deficits^{XD}_{LC-LE} = (CI^{XD}_{Standard} - CI^{XD}_{LC-LE}) \times E^{XD} \times C$$

where:

$CI^{XD}_{Standard}$ is the carbon intensity pursuant to section 95486(b)(3);

CI^{XD}_{LC-LE} is the carbon intensity pursuant to section 95489(e)(3)(A);

E^{XD} is the amount of fuel energy, in MJ, from CARBOB (XD = "CARBOB") or diesel (XD = "diesel"), determined from the energy density conversion factors in Table 4; and

C is the conversion factor set forth in section 95486(b)(3)

(4) Low complexity-low energy use refineries may opt for refinery-specific incremental deficit calculation in lieu of the incremental deficit calculation specified in subsection (b) as provided in this subsection.

(A) Refinery-specific incremental deficit calculation is subject to both of the following restrictions:

1. The low complexity-low energy use refinery must notify the Executive Officer in writing of its intent to opt for refinery-specific incremental deficit calculation by December 31, 2015.

2. The decision to opt for refinery-specific incremental deficit calculation is not reversible, and use of the calculation will be mandatory for all future compliance periods.

(B) Only those volumes of CARBOB and diesel fuel produced from crude oil as reported pursuant to subsection (e)(2)(A) are eligible for refinery-specific incremental deficit calculation. Those volumes of CARBOB and diesel fuel reported pursuant to subsections (e)(2)(B) through (D) must be assessed the incremental deficit as specified in subsection (b). The total incremental deficit for the low complexity-low energy use refinery is calculated as follows:

If $CI_{20XXCrudeAve} > CI_{BaselineCrudeAve}$ and $CI^{LC-LE}_{20XXCrudeAve} > CI^{LC-LE}_{BaselineCrudeAve}$ then:

$$Deficits^{XD}_{Incr20XX} = \left[(CI_{BaselineCrudeAve} - CI_{20XXCrudeAve}) \times (1 - VF) + (CI^{LC-LE}_{BaselineCrudeAve} - CI^{LC-LE}_{20XXCrudeAve}) \times VF\right] \times E^{XD} \times C$$

If $CI_{20XXCrudeAve} > CI_{BaselineCrudeAve}$ and $CI^{LC-LE}_{20XXCrudeAve} \leq CI^{LC-LE}_{BaselineCrudeAve}$ then:

$$Deficits^{XD}_{Incr20XX} = (CI_{BaselineCrudeAve} - CI_{20XXCrudeAve}) \times (1 - VF) \times E^{XD} \times C$$

If $CI_{20XXCrudeAve} \leq CI_{BaselineCrudeAve}$ and
$CI^{LC-LE}_{20XXCrudeAve} > CI^{LC-LE}_{BaselineCrudeAve}$ then:

$$Deficits^{XD}_{Incr20XX} = (CI^{LC-LE}_{BaselineCrudeAve} - CI^{LC-LE}_{20XXCrudeAve}) \times VF \times E^{XD} \times C$$

If $CI_{20XXCrudeAve} \leq CI_{BaselineCrudeAve}$ and
$CI^{LC-LE}_{20XXCrudeAve} \leq CI^{LC-LE}_{BaselineCrudeAve}$ then

$$Deficits^{XD}_{Incr20XX} = 0$$

where:

$Deficits^{XD}_{Incr20XX}$ mean the amount of LCFS incremental deficits incurred (a negative value), in metric tons, by the volume of CARBOB (XD = "CARBOB") and diesel (XD = "diesel") that is derived from petroleum feedstock and is either produced at or supplied to the low complexity-low energy use refinery during a specific calendar year;

$CI_{20XXCrudeAve}$ has the same meaning as specified in subsection (b);

$CI_{BaselineCrudeAve}$ has the same meaning as specified in subsection (b);

$CI^{LC-LE}_{20XXCrudeAve}$ is the Annual Crude Average carbon-intensity value, in gCO_2e/MJ, attributed to the production and transport of the crude oil supplied as petroleum feedstock to the low complexity-low energy use refinery during specified calendar years. The Annual Crude Average carbon intensity value will be calculated using a volume-weighted average of individual crude carbon intensity values. Volumes for individual crudes will be the total volumes reported by the low complexity-low energy use refinery in the Annual Compliance Report for the calendar year. Individual crude carbon intensity values are those listed in Table 8. For crude names not listed, the default carbon intensity value from Table 8 will be used until January 1 of the year that the crude name and carbon intensity value is certified by the Executive Officer as described in subsection (c)(3)(C). $CI^{LC-LE}_{2015CrudeAve}$ will be calculated using data for crude oil supplied to the low complexity-low energy use refinery during the calendar year 2015. $CI^{LC-LE}_{2016CrudeAve}$ will be calculated using data for crude oil supplied to the low complexity-low energy use refinery during the calendar years 2015 and 2016. $CI^{LC-LE}_{2017CrudeAve}$ will be calculated using data for crude oil supplied to the low complexity-low energy use refinery during the calendar

years 2015, 2016, and 2017. All subsequent updates to $CI^{LC-LE}_{20XXCrudeAve}$ will be calculated using data for crude oil supplied to the low complexity-low energy use refinery during the most recent three calendar years;

$CI^{LC-LE}_{BaselineCrudeAve}$ is the average crude oil carbon-intensity value, in gCO_2e/MJ, attributed to the production and transport of the crude oil supplied as petroleum feedstock to the low complexity-low energy use refinery during the baseline calendar year, 2010. For purposes of this provision, $CI^{LC-LE}_{BaselineCrudeAve}$ is the Baseline Crude Average carbon intensity value for the low complexity-low energy use refinery set forth in the Lookup Table. The Baseline Crude Average carbon intensity value is calculated using data for crude oil supplied to the low complexity-low energy use refinery during the baseline calendar year, 2010;

VF means the volume fraction of CARBOB and diesel fuel that is derived from crude oil supplied to the Low Complexity – Low Energy Use refinery;

E^{XD} is the amount of fuel energy, in MJ, from CARBOB (XD = "CARBOB") or diesel (XD = "diesel"), determined from the energy density conversion factors in Table 4, either produced in California or imported into California during a specific calendar year.

$C = 1.0 \times 10^{-6} \frac{MT}{gCO_2e}$.

~~**Table 8. Carbon Intensity Lookup Table for Crude Oil Production and Transport**~~

~~*Country of Origin*~~	~~*Crude Identifier*~~	~~*Carbon Intensity Values (gCO2e/MJ)*~~
	~~Baseline Crude Average*~~	~~11.39~~
	~~Annual Crude Average**~~	~~See 95486(b)(2)(A)1.~~
~~Angola~~	~~Dalia~~	~~7.86~~
	~~Girassol~~	~~10.43~~
	~~Greater Plutonio~~	~~8.82~~
~~Argentina~~	~~Canadon Seco~~	~~7.54~~
	~~Escalante~~	~~7.51~~

	~~Hydra~~	~~8.03~~
~~Australia~~	~~Pyrenees~~	~~5.96~~
~~Brazil~~	~~Albacora Leste~~	~~7.35~~
	~~Frade~~	~~6.62~~
	~~Marlim~~	~~6.75~~
	~~Marlim Sul~~	~~9.69~~
	~~Ostra~~	~~5.71~~
	~~Polvo~~	~~5.62~~
~~Cameroon~~	~~Lokele~~	~~24.02~~
~~Canada~~	~~Albian Heavy Synthetic~~	~~21.02~~
	~~Cold Lake~~	~~18.74~~
	~~Federated~~	~~7.77~~
	~~Koch Alberta~~	~~7.61~~
	~~Mixed Sweet Blend~~	~~7.75~~
	~~Suncor Synthetic A~~	~~24.49~~
	~~Suncor Synthetic C~~	~~24.49~~
	~~Syncrude Sweet Premium~~	~~21.87~~
~~Colombia~~	~~Castilla Blend~~	~~6.45~~
	~~Vasconia~~	~~6.63~~
~~Ecuador~~	~~Napo~~	~~7.45~~
	~~Oriente~~	~~9.34~~
~~Iraq~~	~~Basra Light~~	~~12.08~~
~~Kuwait/Saudi Arabia Partitioned Zone~~	~~Eocene~~	~~5.59~~
	~~Ratawi~~	~~5.77~~

Nigeria	Bonny Light	17.88
Oman	Oman	12.30
Peru	Loreto	5.82
	Mayna	7.14
Russia	ESPO	12.09
Saudi Arabia	Arab Extra Light	6.86
	Arab Light	6.75
Trinidad and Tobago	Calypso	6.95
United States	Alaska North Slope	12.81
	California Average Production	12.90
Venezuela	Boscan	12.53
	Petrozuata	23.58
	Zuata Sweet	23.50

* Based on production and transport of the crude oil supplied to California refineries during the baseline calendar year, 2010
** Based on production and transport of the crude oil supplied to California refineries during a specified calendar year or years. The Annual Crude Average CI value will be first calculated for calendar year 2012 and subsequently updated annually using data for crude oil supplied to California refineries during the specified calendar year or years.

(2) *Lookup-Table Carbon-Intensity Values.*

(A) *For CARBOB and Diesel Fuel.*

Deficit calculations to be used for a regulated party's CARBOB or diesel fuel are specified in section 95486(b)(2)(A)1. Requirements for adding incremental emission increases associated with an increase in the carbon intensity of crude oil to a regulated party's compliance obligation are specified in section 95486(b)(2)(A)2. The credit calculation for CARBOB or diesel derived from petroleum feedstock which is produced using innovative methods such as carbon capture and sequestration (CCS) is specified in section 95486(b)(2)(A)4.

1. *Deficit Calculation for CARBOB or Diesel Fuel.*

~~A regulated party for CARBOB or diesel fuel must calculate separately the base deficit and incremental deficit for each fuel or blendstock derived from petroleum feedstock as specified in this provision.~~

~~Base Deficit Calculation~~

$$Deficits^{XD}_{Base}\ (MT) = (CI^{XD}_{Standard} - CI^{XD}_{BaselineAvg}) \times E^{XD} \times C$$

~~Incremental Deficit Calculation to Mitigate Increases in the Carbon-Intensity of Crude Oil~~

$$If\ \ CI^{XD}_{20XXCrudeAvg} > CI^{XD}_{BaselineCrudeAvg}\ \ then:$$

$$Deficits^{XD}_{Incremental\ 20XX} =$$

$$(CI^{XD}_{BaselineCrudeAvg} - CI^{XD}_{20XXCrudeAvg}) \times E^{XD} \times C$$

$$If\ \ CI^{XD}_{20XXCrudeAvg} \leq CI^{XD}_{BaselineCrudeAvg}\ \ then:$$

$$Deficits^{XD}_{Incremental\ 20XX} = 0$$

~~where,~~

~~$Deficits^{XD}_{Base}(MT)$ and $Deficits^{XD}_{Incremental20XX}$ mean the amount of LCFS deficits incurred (a negative value), in metric tons, by the volume of CARBOB and diesel that is derived from petroleum feedstock and is either produced in or imported into California during a specific calendar year;~~

~~$CI^{XD}_{Standard}$ has the same meaning as specified in section 95485(a)(3)(A);~~

~~$CI^{XD}_{BaselineAvg}$ is the average carbon-intensity value of CARBOB or diesel, in gCO2E/MJ, that is derived from petroleum feedstock and is either produced in or imported into California during the baseline calendar year, 2010. For purposes of this provision, $CI^{XD}_{BaselineAvg}$ for CARBOB (XD = "CARBOB") and diesel fuel (XD = "diesel") are the Baseline Average carbon intensity values for CARBOB and diesel (ULSD) set forth in the Carbon Intensity Lookup Table. The Baseline Average carbon intensity values for CARBOB and diesel (ULSD) are calculated using data for crude oil supplied to California refineries during the baseline calendar year, 2010.~~

$$CI^{XD}_{BaselineCrudeAvg}$$

~~is the California average crude oil carbon-intensity value, in gCO2E/MJ, attributed to the production and transport of the crude oil supplied as petroleum feedstock to California refineries during the baseline calendar year, 2010. For purposes of this provision, $CI^{XD}_{BaselineCrudeAvg}$ for CARBOB (XD = "CARBOB") and diesel fuel (XD = "diesel") is the Baseline Crude Average carbon intensity value set forth in the Lookup Table. The Baseline Crude Average carbon intensity value is calculated using data for crude oil supplied to California refineries during the baseline calendar year, 2010.~~

~~$CI^{XD}_{20XXCrudeAvg}$ is the California average crude oil carbon-intensity value, in gCO2E/MJ, attributed to the production and transport of the crude oil supplied as petroleum feedstock to California refineries during specified calendar years. For purposes of this provision, $CI^{XD}_{20XXCrudeAvg}$ for CARBOB (XD = "CARBOB") and diesel fuel (XD = "diesel") is the Annual Crude Average carbon intensity value set forth in the Lookup Table. $CI^{XD}_{20XXCrudeAvg}$ will be updated annually. $CI^{XD}_{2012CrudeAvg}$ will be calculated using data for crude oil supplied to California refineries during the calendar year 2012. $CI^{XD}_{2013CrudeAvg}$ will be calculated using data for crude oil supplied to California refineries during the calendar years 2012 and 2013. $CI^{XD}_{2014CrudeAvg}$ will be calculated using data for crude oil supplied to California refineries during the calendar years 2012, 2013, and 2014. All subsequent updates to $CI^{XD}_{20XXCrudeAvg}$ will be calculated using data for crude oil supplied to California refineries during the most recent three calendar years.~~

~~E^{XD} is the amount of fuel energy, in MJ, from CARBOB (XD = "CARBOB") or diesel (XD = "diesel"), determined from the energy density conversion factors in Table 4, either produced in California or imported into California during a specific calendar year.~~

~~C has the same meaning as specified in section 95485(a)(3)(A).~~

2. ~~*Addition of Incremental Deficits that Result from Increases in the Carbon-Intensity of Crude Oil to a Regulated Party's Compliance Obligation.*~~

   a. ~~Incremental deficits for CARBOB or diesel fuel that result from increases in the carbon-intensity of crude oil will be calculated and added to each affected regulated party's compliance obligation for the compliance period in which the $Deficits^{XD}_{Incremental20XX}$ become effective, which will be the year following the year in which the $CI^{XD}_{20XXCrudeAvg}$ was established and added to the Lookup Table.~~

b. Incremental deficits for CARBOB or diesel fuel for each regulated party will be based upon the amount of CARBOB and Diesel fuel supplied by the regulated party in each compliance period for which the $Deficits^{XD}_{Incremental20XX}$ are effective.

3. Process for Calculating the Annual Crude Average Carbon Intensity Value.

a. The Annual Crude Average carbon intensity value will be calculated using a volume-weighted average of individual crude carbon intensity values. Volumes for individual crudes will be the total volumes reported by all regulated parties in the Annual Compliance Reports for the calendar year. Individual crude carbon intensity values are those listed in Table 8.

b. Within 15 days of receiving the Annual Compliance reports, the Executive Officer shall post the Annual Crude Average carbon intensity calculation at the ARB-LCFS website (http://www.arb.ca.gov/fuels/lcfs/lcfs.htm) for public comment. Written comments shall be accepted for 15 calendar days following the date on which the analysis was posted. Only comments related to potential factual or methodological errors in the posted Annual Crude Average carbon intensity value may be considered. The Executive Officer shall evaluate the comments received and, if the Executive Officer deems it necessary, may request in writing additional information or clarification from the commenters. Commenters shall have 10 days to respond to these requests. The Executive Officer shall post the final Annual Crude Average carbon intensity value at the ARB-LCFS website within 15 days of completion of the comment period, if no comments are received. If comments are received, the Executive Officer shall post the final Annual Crude Average carbon intensity value within 15 days of receiving any additional information or clarification requested from the commenters by the Executive Officer.

4. Credit for Purchasing Crudes Produced using Innovative Crude Production Methods.

A regulated party may receive credit for fuel or blendstock derived from petroleum feedstock which has been produced using innovative methods. For the purpose of this section, an innovative

~~method means crude production using carbon capture and sequestration or solar steam generation that was implemented by the crude producer during or after the year 2010 and results in a reduction in carbon intensity for crude oil recovery (well to refinery entrance gate) of 1.00 gCO2E/MJ or greater. The crude oil producer must submit to ARB carbon intensity values for petroleum feedstock recovered both with and without implementation of the innovative method. Credits for CARBOB, gasoline, or diesel derived from this petroleum feedstock must be calculated as specified below:~~

$$Credits_{Innov}^{XD}\ (MT) = (\ CI_{Without}^{XD} - CI_{With}^{XD}\ )_{Innov} \times E_{Innov}^{XD} \times C$$

~~where,~~

~~$Credits_{Innov}^{XD}\ (MT)$ mean the amount of LCFS credits generated (a positive value), in metric tons, by the volume of a fuel or blendstock produced in California and derived wholly from petroleum feedstock which uses the innovative production method;~~

~~CI_{With}^{XD} means the carbon intensity value, in gCO2E/MJ, of the petroleum feedstock produced with the innovative method;~~

~~$CI_{Without}^{XD}$ means the carbon intensity value, in gCO2E/MJ, of the petroleum feedstock produced using a similar process but without the innovative method (hereinafter referred to as the comparison baseline method);~~

~~E_{Innov}^{XD} is the amount of fuel energy, in MJ, from CARBOB (XD = "CARBOB") or diesel (XD = "diesel"), determined from the energy density conversion factors in Table 4, produced in California and derived wholly from petroleum feedstock produced with the innovative method;~~

~~C has the same meaning as specified in section 95485(a)(3)(A).~~

~~a. General Requirements. The innovative crude oil production method must be approved for use pursuant to this section before a regulated party can receive credit under the LCFS regulation for producing fuels or blendstocks from the innovative crude. This regulatory approval must be initiated by the crude oil producer through a written application to the Executive Officer. The application must contain at least the following:~~

i. A description of the innovative method, the comparison baseline method, and how emissions are reduced;

ii. An engineering drawing(s) or process flow diagram(s) that illustrate the innovative method;

iii. Calculations using the OPGEE model, or alternative model approved by the Executive Officer, to estimate the carbon intensities for the production of the crude using the innovative method and the comparison baseline method. The calculations must identify all modified parameters in the model and demonstrate that the inputs to the model accurately reflect the conditions specific to the crude production process;

iv. Any other technical documentation to support the applicant's claim that emissions will be reduced from the use of the innovative method.

b. Scientific Defensibility and Substantiality. For a proposed application for the use of innovative crude oil production methods to be approved, the applicant must demonstrate both that the innovative method is scientifically defensible and that it meets a substantiality requirement. These requirements are specified below:

i. Scientific Defensibility. A crude oil producer that seeks approval for an innovative crude oil production method bears the sole burden of demonstrating that the proposed innovative crude oil production method is scientifically defensible. Proof that a proposed innovative crude oil production method is scientifically defensible may rely on, but is not limited to, publication of the proposed innovative crude oil production method in a major, well established and peer-reviewed scientific journal (e.g., Science, Nature, Journal of the Air and Waste Management Association, Proceedings of the National Academies of Science).

ii. Substantiality Requirement. For each of its crude oils for which a crude oil producer is seeking approval as an innovative crude oil production method, the applicant must demonstrate that the proposed innovative crude oil production method has a well-to-

~~refinery gate carbon intensity that is at least 1.00 gram CO2-eq/MJ less than the well-to-refinery gate carbon intensity for the crude oil produced using the comparison baseline method. "Well-to-refinery gate" means all the steps involved in the extraction, production and transport of the crude oil to California, but it does not include the carbon intensity due to refining the crude oil, transporting the fuel, or the vehicle's use of the fuel.~~

~~c. Application and Data Submittal. A crude oil producer may apply to the Executive Officer for approval of an innovative crude oil production method under the LCFS. Unless otherwise noted, all applications for an innovative crude oil production method shall comply with the requirements below.~~

~~i. An applicant that submits any information or documentation in support of a proposed innovative crude oil production method must include a written statement clearly showing that the applicant understands and agrees to the following:~~

~~A. The applicant must specifically identify all information submitted pursuant to this provision that is a trade secret; "trade secret" has the same meaning as defined in Government Code section 6254.7;~~

~~B. All information in the application not identified as trade secrets are subject to public disclosure pursuant to title 17, CCR, sections 91000-91022 and the California Public Records Act (Government Code sec. 6250 et seq.); and~~

~~C. If the application is approved, the carbon intensity values will be incorporated into the Crude Lookup Table and LCFS Reporting Tool~~

~~ii. All applications shall include a detailed description of the innovative method and its comparison baseline method. The description must include:~~

~~A. Schematic flow charts that identify the system boundaries used for the purposes of~~

~~performing the life cycle analyses on the proposed innovative crude oil production method and the comparison baseline method. Each piece of equipment or stream appearing on the process flow diagrams shall be clearly identified and shall include data on its energy and materials balance. The system boundary shall be shown in the schematic.~~

~~B. A description of all feedstocks used, including their points of origination, all feedstock transportation distances and modes, and all processing to which feedstocks are subject. This discussion shall cover energy and chemical use, transport modes and distances, storage, and processing. A description of all non-feedstock inputs used in the crude production process.~~

~~C. A description of all co-products, byproducts, and waste products.~~

~~D. A description of all facilities involved in the production of the crude oil and other byproducts, co-products, and waste products.~~

~~E. A list of all combustion-powered equipment, along with their respective capacities, sizes, or rated power, fuel utilization type, and proposed use throughout the crude production lifecycle.~~

~~F. A description of the thermal and electrical energy consumption that occurs throughout the crude production life cycle. All fuels used (natural gas, biogas, coal, biomass, etc.) must be identified. The regional electrical energy generation fuel mix used in the analysis must be identified. Internally generated power such as cogeneration and combined heat and power must also be described.~~

~~G. A description of the transportation modes used throughout the crude production life cycle. This discussion must identify origins and destinations (at least on a regional basis),~~

~~cargo carrying capacities, fuel shares, and the distances traveled in each case.~~

~~iii. The application shall include complete life cycle assessments performed on the proposed innovative crude oil production method and its comparison baseline method using OPGEE or an alternative model approved by the Executive Officer. Electronic copies of the models shall be provided. The descriptions of the life cycle assessment results must provide~~

~~A. Detailed information on the energy consumed, the greenhouse gas emissions generated, and the final carbon intensity.~~

~~B. Documentation of all non-default model input values used in the carbon intensity calculation process. If values for any significant crude oil production parameters are unknown, the application shall so state and model default values shall be used for these parameters in the analysis.~~

~~C. Detailed description of all supporting calculations that were performed outside of the model.~~

~~D. Documentation of all modifications other than those covered by item (II) above, made to the model. This discussion shall include sufficient specific detail to enable the Executive Officer to replicate all such modifications and, in combination with the inputs and supporting calculations identified in items II and III above, replicate the carbon intensity results reported in the application.~~

~~iv. A list of references covering all information sources used in the preparation of the life cycle analysis. All reference citations in the lifecycle analysis report shall include in-text parentheticals stating the author's last name and date of publication. All in-text parenthetical citations shall correspond to complete publication information provided in the list of references, and complete publication information shall at a minimum,~~

identify the author(s), author's affiliation, title of the referenced document, publisher, publication date, and pages cited. For internet citations, the reference shall include the universal resource locator (URL) address of the citation, as well as the date the website was last visited.

v. A signed transmittal letter from the applicant attesting to the veracity of the information in the application packet and declaring that the information submitted accurately represents the long-term, steady state operation of the innovative crude oil production method described in the application packet. The transmittal letter shall be the original copy, be on company letterhead, be signed by an officer of the applicant with authority to attest to the veracity of the information in the application and to sign on behalf of the applicant, and be from the applicant and not from an entity representing the applicant (such as a consultant or legal counsel).

vi. All documents (including spreadsheets and other items not in a standard document format) that contain confidential business information (CBI) must prominently display the phrase "Contains Confidential Business Information" above the main document title and in a running header. Additionally, a separate, redacted version of such documents must also be submitted. The redacted versions must be approved by the applicant for posting to a public LCFS web site. Within redacted documents, specific redactions must be replaced with the phrase "Confidential business information has been deleted." This phrase must be displayed clearly and prominently wherever CBI has been redacted.

vii. All applications, supporting documents, and all other relevant data or calculation or other documentation, except for the transmittal letter described in paragraph (v) above, shall be submitted electronically such as via e-mail or an online-based interface unless the Executive Officer has approved or requested in writing another submission format.

d. Application Approval Process. The application must be approved pursuant to this section before a regulated party

may obtain credit under the LCFS regulation for producing fuels or blendstocks from the innovative crude.

i. Within 30 calendar days of receipt of an application designated by the applicant as ready for formal evaluation, the Executive Officer shall advise the applicant in writing either that:

A. The application is complete, or

B. The application is incomplete and the Executive Officer will identify which requirements of section 95486(b)(2)(A)(4)a-c. above have not been met.

1. The applicant will be permitted to submit additional information to meet the requirements to section 95486(b)(2)(A)(4)a-c.

2. If the applicant is unable to achieve a complete application within 180 days of the Executive Officer's receipt of the application, the application will be denied on that basis, and the applicant will be informed in writing.

ii. Once the Executive Officer has deemed an application to be complete, it will be posted for public comment at http://www.arb.ca.gov/fuels/lcfs/lcfs.htm. Comments will be accepted for 10 calendar days following the date on which the application was posted. Only comments related to potential factual or methodological errors may be considered. The Executive Officer will forward to the applicant all comments identifying potential factual or methodological errors. Within 30 days, the applicant shall either make revisions to its application and submit those revisions to the Executive Officer, or submit a detailed written response to the Executive Officer explaining why no revisions are necessary.

iii. An application submitted pursuant to this section shall not be approved if the Executive Officer determines:

A. Based upon the application information submitted pursuant to this section, the proposed crude production method is not innovative, as that term is defined in this section.

B. Based upon the application information submitted pursuant to this section, the applicant's carbon intensity calculations cannot be replicated using the ARB OPGEE model.

iv. If the Executive Officer finds that an application meets the requirements set forth in subsection 95486(b)(2)(A)4, the Executive Officer will take final action to approve the crude oil carbon intensity value and the associated innovative crude oil production method, describing all limitations and operational conditions to which the innovative crude oil production method will be subject, by amending this section 95486 in accordance with Government Code section 11340, et seq. If the Executive Officer finds that an application does not meet the requirements of subsection 95486(b)(2)(A)4, the application will not be approved, and the applicant will be notified in writing and the basis for the disapproval shall be identified.

v. Recordkeeping. Each crude oil producer that has crude approved as innovative must maintain records identifying each facility at which it produces crude oil for sale in California under the approved innovative crude oil production method. For each such facility, the crude oil producer must compile records for at least three years showing:

A. The annual volume of crude oil produced using the approved innovative crude oil production method and the annual volume of crude subsequently sold in California under the approved innovative crude oil production method.

B. Compliance with all limitations and operational conditions identified by the Executive Officer in paragraph iv, above.

~~If the crude oil approved as innovative is marketed as part of a crude blend, the crude oil producer must also maintain for at least three years annual records identifying the constituent crudes that comprise the blend and the percentage that each constituent crude contributes to the blend.~~

~~These records shall be submitted to the Executive Officer within 20 days of a written request received from the Executive Officer or his/her designee, provided the request is made before the expiration of the period during which the records are required to be retained.~~